

CALIFORNIA BUILDING CODE

NONSTRUCTURAL DESIGN REQUIREMENTS

This section contains portions of the California Building Code which relate to basic minimum nonstructural design requirements for a residence.

EMERGENCY ESCAPE WINDOWS

Section 310.4 Basements in dwelling units and every sleeping room below the fourth story shall have at least one operable window or door approved for emergency escape or rescue that shall open directly into a public street, public alley, yard or exit court. The door or window shall be operable from the inside to provide a full clear opening without the use of separate tools.

All escape or rescue windows shall have a minimum net clear openable area of 5.7 square feet. The minimum net clear openable height dimension shall be twenty-four inches. The minimum net clear openable width dimension shall be twenty inches. When windows are provided as a means of escape or rescue they shall have a finished sill height not more than forty-four inches above the floor. This measurement is taken from the floor to the clear opening of the window, not the lower, wooden, plaster or sheetrock window stool.

Bars, grilles, grates or similar devices may be installed on an emergency escape or rescue windows or doors, provided:

1. Such devices are equipped with approved release mechanisms which are openable from the inside without the use of a key or special knowledge or effort; and
2. The building is equipped with smoke detectors installed in accordance with section 310.9.

LIGHT, VENTILATION AND SANITATION

Section 1203.1 General. For the purpose of determining the light or ventilation required by this section, any room may be considered as a portion of an adjoining room when one-half of the area of the common wall is open and unobstructed and provides an opening of not less than one-tenth of the floor area of the interior room or twenty-five square feet, whichever is greater.

Exterior openings for natural light or ventilation required by this section shall open directly onto a street or public alley or a yard or court located on the same lot as the building.

EXCEPTIONS:

1. Required windows may open into a roofed porch where the porch:
 - A. Abuts a street, yard or court; and
 - B. Has a ceiling height of not less than 7 feet; and
 - C. Has the longer side at least sixty-five percent open and unobstructed.
2. Skylights.

Section 1203.2 Light. Guest rooms and habitable rooms within a dwelling unit or congregate residence shall be provided with natural light by means of exterior glazed openings with an area not less than one-tenth of the floor area of such rooms with a minimum of ten square feet.

Section 1203.3 Ventilation. Guest rooms and habitable rooms within a dwelling unit or congregate residence shall be provided with natural ventilation by means of openable exterior openings with an area of not less than one-twentieth of the floor area of such rooms with a minimum of five square feet.

In lieu of required exterior openings for natural ventilation, a mechanical ventilating system may be provided. Such system shall be capable of providing two air changes per hour in all habitable rooms.

All bathrooms, water closet compartments, and similar rooms shall be provided with natural ventilation by means of openable exterior openings with an area not less than one-twentieth of the floor area of such rooms with a minimum of 1 1/2 square feet.

In lieu of required exterior openings for natural ventilation in bathrooms containing a bathtub or shower or combination thereof, and similar rooms, a mechanical ventilation system connected directly to the outside capable of providing five air changes per hour shall be provided. The point of discharge of exhaust air shall be at least three feet from any opening into an occupied portion of the building. Bathrooms that contain only a water closet or lavatory or combination thereof, and similar rooms may be ventilated with an approved mechanical recirculating fan or similar device designed to remove odors from the air.

CEILING HEIGHTS (CBC 310.6.1)

Habitable rooms or areas except kitchens must have a ceiling height of at least 7'6". Kitchens, halls, bathrooms and toilet compartments may have a ceiling height of at least 7'0", measured to the lowest projection from the ceiling.

If a room has a sloping ceiling, at least half the area of that room must have the prescribed ceiling height. No portion of the room measuring less than five feet from the finished floor to the finished ceiling can be included in figuring the minimum area. If a room has a furred-down ceiling, the required minimum ceiling height is required in two-thirds of the area, but in no case may the height of the furred ceiling be less than 7'0".

FLOOR AREA (CBC 310.6.2)

Dwelling units and congregate residences shall have at least one room which is at least 120 square feet in area. Other habitable rooms, except kitchens, must have a minimum area of at least 70 square feet.

WIDTH (CBC 310.6.3)

No habitable room, other than a kitchen, may be less than seven feet in any dimension. Alcoves and entryways having dimensions less than seven feet are allowed within rooms, but cannot be included when calculating the minimum area of the room.

SMOKE DETECTORS (CBC 310.9.1)

1. General. Dwelling units, congregate residences and hotel or lodging house guest rooms that are used for sleeping purposes shall be provided with smoke detectors. Detectors shall be installed in accordance with the manufacturer's installation instructions.

2. Additions, alterations or repairs to Group R Occupancies. When the valuation of an addition, alteration or repair to a Group R Occupancy exceeds \$1,000 and a permit is required, or when one or more sleeping rooms are added or created in existing Group R Occupancies, smoke detectors shall be installed in accordance with Subsections 3, 4 and 5 of this Section.

3. Power Source. In new construction, required smoke detectors shall receive their primary power from the building wiring when such wiring is served from a commercial source and shall be equipped with a battery backup. The detector shall emit a signal when the batteries are low. Wiring shall be permanent and without a disconnect switch other than those required for overcurrent protection. Smoke detectors may be solely battery operated when installed in existing buildings; or in buildings without commercial power; or in buildings which undergo alterations, repairs or additions regulated by Subsection 2 of this Section.

4. Location within dwelling units. In dwelling units, a detector shall be installed in each sleeping room and at a point centrally located in the corridor or area giving access to each separate sleeping area. When the dwelling unit has more than one story and in dwellings with basements, a detector shall be installed on each story and in

the basement. In dwelling units where a story or basement is split into two or more levels, the smoke detector shall be installed on the upper level, except that when the lower level contains a sleeping area, a detector shall be installed on each level. When sleeping rooms are on an upper level, the detector shall be placed at the ceiling of the upper level in close proximity to the stairway. In dwelling units where the ceiling height of a room open to the hallway serving the bedrooms exceeds that of the hallway by twenty-four inches or more, smoke detectors shall be installed in the hallway and in the adjacent room. Detectors shall sound an alarm audible in all sleeping areas of the dwelling unit in which they are located.

HEATING (CBC 310.11)

All habitable rooms in a dwelling unit must be provided with heating facilities that are capable of maintaining a room temperature of 70 degrees Fahrenheit at a point three feet above the floor.

ATTACHED GARAGES [CBC 302, 312.4]

A fire separation is required between a residence and an attached garage. It may be vertical or horizontal or both or of whatever form may be required to completely separate the residence and the garage. Where any part of the separation is horizontal, any walls or columns which support the horizontal portion must also be protected. Protected walls must have 5/8" type X gypsum wallboard on the garage side of the wall. Ceilings framed at 24" o.c. must have two layers of 5/8" type X wallboard, but those framed at 16" o.c. only need one layer. Resilient channel (RC channel) may be installed @ 16" o.c. perpendicular to 24" o.c. ceiling framing and covered with one layer of 5/8" type X wallboard. Any door between the house and the garage must be self-closing and be a 20-minute rated and labeled door or a minimum 1 3/8" thick, solid wood door. Where self-closing hinges are used, a minimum of two self-closing hinges are required.

A door from a sleeping room may not open directly into a garage.

ATTACHED CARPORTS (CBC 302.1 Exception 3)

An occupancy separation need not be provided between a residence and a carport having no enclosed uses above, provided the carport is entirely open on two or more sides.

DETACHED GARAGES AND ACCESSORY BUILDINGS

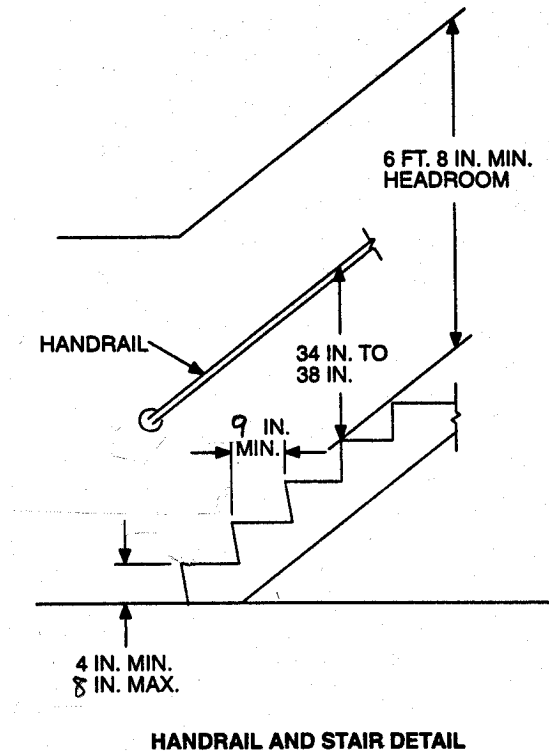
Any structure less than three feet from a property line must have a one hour fire wall along that side and no openings (windows, doors, etc.) are permitted in this wall. An open sided carport or trellis must therefore be a minimum of three feet from a property line to the face of its supports. One hour construction in this situation usually means 5/8 inch type X gypsum wallboard attached to the exterior side of the wall studs with exterior weather protection applied over the gypsum board or 7/8" thick plaster exterior wall covering.

Detached structures must be a minimum of six feet from any other structure. This distance is measured from face of support to face of support. Roof overhangs are permitted to extend into a yard to a minimum of two feet from property line or four feet from adjacent structure walls.

Bear in mind that both the City Planning and Building Divisions criteria are considered when deciding how close one may build to a property line. Building setback lines may require greater distances from property lines than California Building Code regulations require.

STAIRWAYS AND LANDINGS (CBC 1003.3.3)

Private stairways shall be a minimum of thirty-six inches wide. Trim and handrails may not encroach into this minimum width by more than 3 1/2 inches. The maximum rise of each step is eight inches; the minimum rise is four inches. The minimum run is nine inches. The largest tread width or riser height in any flight of stairs shall not exceed the smallest by more than 3/8 inch.



Every stairway must have a headroom clearance of not less than 6'8" measured vertically from the plane of the tread nosing to the soffit above at all points.

Enclosed useable space under stairs must be protected on the enclosed side by 5/8" type X gypsum wallboard.

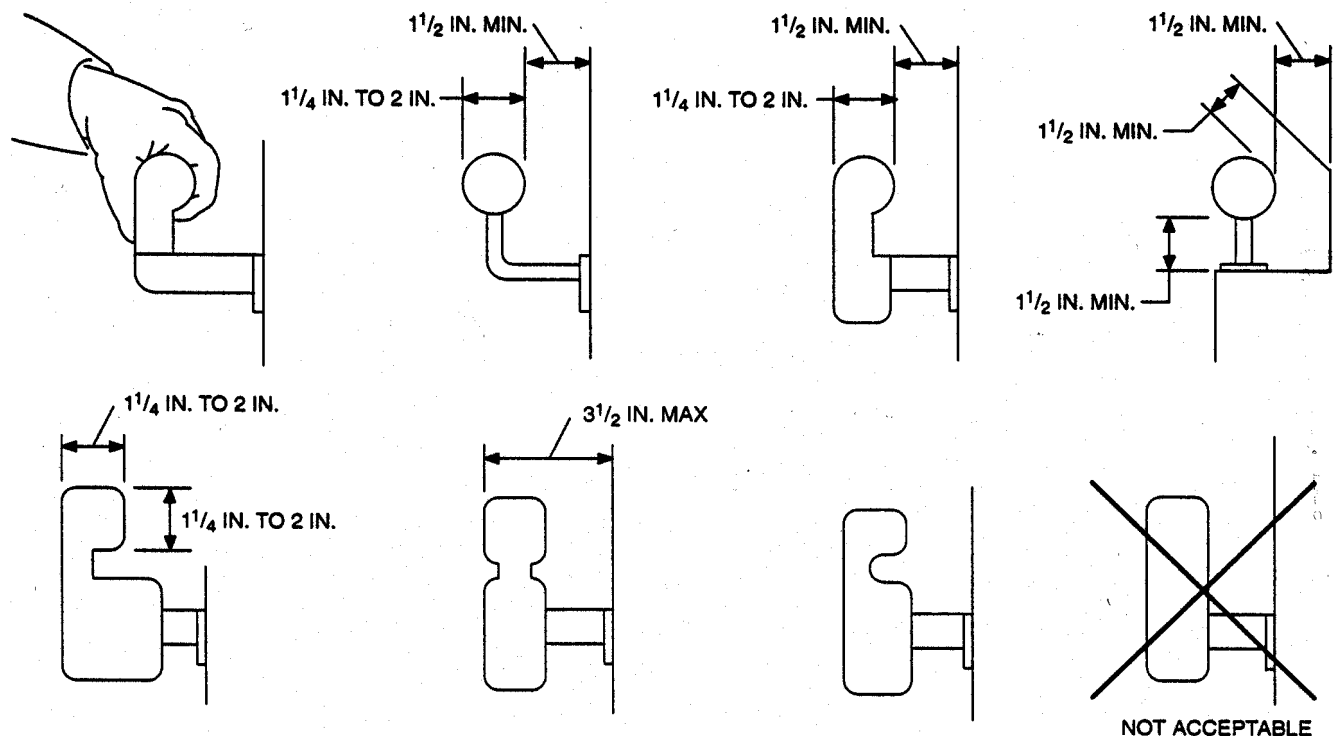
Landings must have a width and a dimension measured in the direction of travel not less than the width of the stairway. Doors in the fully open position shall not reduce a required dimension by more than 7 inches.

All exterior doors shall have a landing immediately on the exterior side. These landings shall be as wide as the door and a minimum of 36 inches in the direction of travel. These landings must be no more than 8 inches below the interior floor level. If the door swings out over the landing this dimension is 1 inch maximum.

An interior door at the top of a flight of stairs need not have a landing at the top of the stairs, provided the door swings away from the stairs.

HANDRAILS (CBC 1003.3.3.6)

The intent of a handrail is to provide a handgrip for people using a stairway. Stairways which serve an individual dwelling unit must have a handrail on one side if they have four risers or more. Such stairways with fewer than four risers are not required to have handrails. Handrails projecting from a wall shall have not less than 1 1/2 inches between the wall and handrail. Handrails must be placed between thirty-four and thirty-eight inches above the nosing of the stair treads. Ends must be returned or have rounded terminations or bends. The handgrip portion of handrails shall not be less than 1 1/4 inches nor more than 2 inches in cross-sectional dimension or the shape shall provide an equivalent gripping surface. The handgrip portion of handrails shall have a smooth surface with no sharp corners.



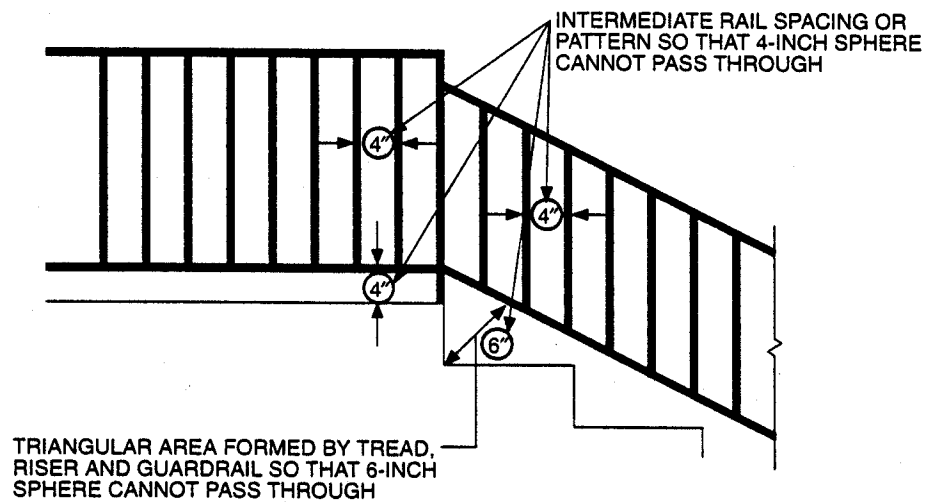
NOTE: Other shapes may be acceptable if they provide an equivalent gripping surface. See third paragraph of Section 1003.3.3.6.

ACCEPTABLE SHAPES AND INSTALLATIONS—HANDRAIL

GUARDRAILS (CBC 509)

The intent of a guardrail is to prevent people, particularly small children, from falling off the edge of a horizontal standing surface. Open sides of floor openings, stairways, landings, ramps, balconies, or porches, which are more than 30 inches above grade or the floor below shall be protected by a guardrail.

The top of residential guardrails must be at least 36 inches above the upper standing surface. Guardrails must have intermediate rails or an ornamental pattern placed in such a manner that a sphere four inches in diameter cannot pass through. The triangular openings formed by the riser, tread and bottom element of a guardrail at the open side of a stairway may be of such size that a sphere 6 inches in diameter cannot pass through.



GUARDRAILS

FOOTINGS AND FOUNDATIONS

Prior to pouring any concrete, the bottom of the footings must be cleaned out, removing any loose soil, wood, or debris. Roots must also be removed. All reinforcing steel must be held away from contact with soil or forms. (Note: The use of steel bars driven into the ground to support rebar is prohibited.) Three inches of clearance is required from reinforcing bars to sides and bottom of earth-formed footings, and 1 1/2 inches clearance is required from #5 and smaller reinforcing bars to forms.

Reinforcing steel when spliced must have a minimum lap of twenty inches for #4 (1/2 inch) bars and twenty-five inches for #5 (5/8 inch) bars. Where a new footing intersects an existing footing the new reinforcing must be doweled at least six inches into the existing footing.

Minimum rebar requirements in stemwalls are as follows:

NON-RETAINING WALLS

- bottom bar 3" - 4" from earth
- top bar 2" - 6" from top of wall
- maximum 24" between horizontal bars
- maximum 48" height above grade, or get engineering

RETAINING WALLS

- up to 30" retaining (grade difference) - same as non-retaining
- up to 48" retaining - same horizontal as non-retaining and verticals @ 24" o.c.
- more than 48" retaining - get engineering

Precast concrete pier blocks supporting floor girders must be set in a concrete footing a minimum of fourteen inches square by six inches deep. Larger footings may be required based on loading. The pier excavations should be dug, with rebar firmly in place, and the pier blocks should be on site at the time of the footing inspection.

Wood forms located in the ground, or between the foundation sills and the ground, must be removed after pouring concrete.

SLABS ON GRADE

Concrete slabs supported directly on the ground may not be less than 3 1/2 inches thick. A continuous footing as described above is required. Any reinforcement in slabs on grade must have two inches of clearance from soil. If untreated fir sill plates are to be used for interior partitions, a vapor barrier of six mil visqueen minimum is required.

FLOOR JOISTS, GIRDERS AND POSTS

For details on attachment of the mudsill to the foundation, see the section on SILL PLATES under **WALL FRAMING**.

When wood floor joists or the bottom of wood structural floors without joists are located closer than 18 inches or wood girders are located closer than 12 inches to exposed ground within the periphery of the building foundation, the floor assembly, including posts, girders, joists, and subfloor, shall be pressure treated wood.

The bottoms of posts supporting girders must be at least 6 inches above earth unless they are pressure treated. This is usually done with precast pier blocks.

Girder splices must occur over posts and must be provided with an adequate tie, such as a wood or metal gusset.

The ends of each joist shall have at least 1 1/2 inches of bearing on wood or metal. Where pressure treated joists bear directly on concrete or masonry, they must have at least 3 inches of bearing.

Solid 2X nominal blocking is required at ends of joists and over all bearing points. Blocking may be omitted where ends of joists are nailed to a header or rim joist.

Joists framing from opposite sides of a beam, girder or partition shall be lapped at least three inches or the opposing joists shall be tied together in an approved manner.

Notches on ends of joists must not exceed 1/4 the depth of the joist. Other notches in the top or bottom of joists must not exceed 1/6 the joist depth and must not be located in the middle 1/3 of the joist span.

Holes bored in joists must not be within two inches of the top or bottom and the diameter must not exceed 1/3 of the joist depth.

Trimmer and header joists at openings must be doubled when the header span exceeds 4 feet.

A table of allowable spans for floor joists is included on page 25.

UNDER FLOOR VENTILATION

Under floor areas must be ventilated by mechanical means or by openings in the exterior foundation walls. The openings must have a net area of 1 square foot for each 150 square feet of under floor area and should be located to provide cross ventilation. Openings must be screened with corrosion resistant wire mesh with openings of 1/4 inch dimension.

PLYWOOD SUBFLOORING

Plywood floor nailing is required to be 6 inches on center on all edges and 12 inches on center on intermediate supports. The thickness of plywood will be determined by your joist spacing and the panel identification index of plywood selected for use. All plywood flooring edges must be tongue and groove joints or must be supported with blocking.

NOTES:

FOOTINGS TO BE EXCAVATED INTO
UNDISTURBED SOIL TO DEPTH D

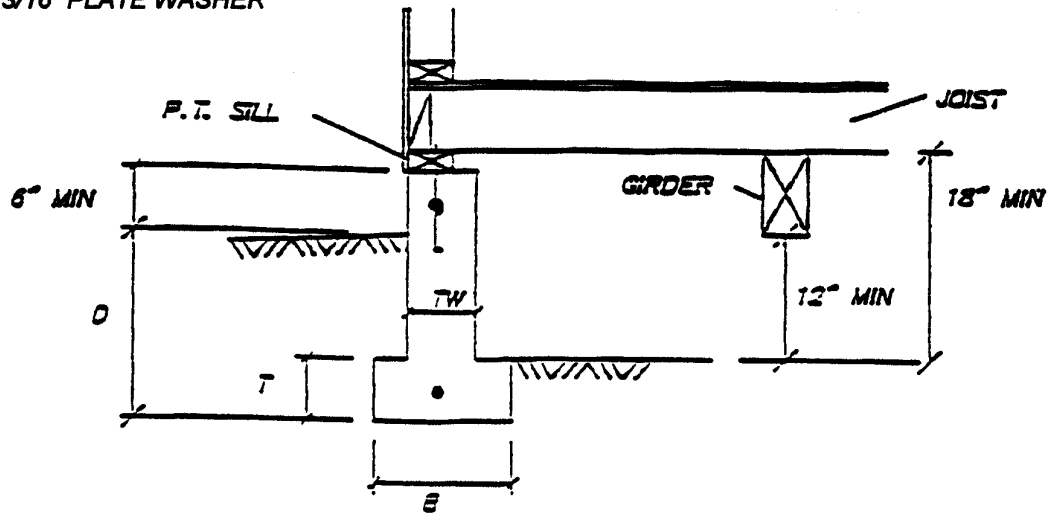
SEE PAGE 14 FOR MINIMUM REBAR
REQUIREMENTS

ANCHOR BOLTS SHALL BE PER
1998 CBC SECTION 1806.6

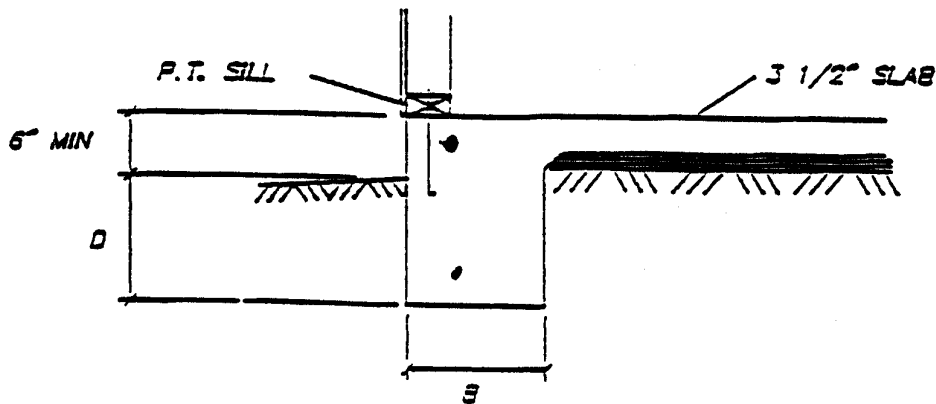
EACH ANCHOR BOLT MUST HAVE A
2" X 2" X 3/16" PLATE WASHER

FLOORS	B	D	TW	T
ONE	12"	12"	6"	6"
TWO	15"	18"	8"	7"

FLOORS REFERS TO NUMBER OF FLOORS
PER 1998 CBC TABLE 18-I-C, FOOTNOTE 5



RAISED FLOOR FOOTING



SLAB ON GRADE FOOTING

TOWN OF PARADISE

TYPICAL RESIDENTIAL FOUNDATION DETAILS

SCALE: 3/4"=1'-0"

WALL FRAMING

SILL PLATES

Studs shall have full bearing on a plate or sill not less than 2 inches in nominal thickness and having a width not less than that of the wall studs.

Exterior wall sill plates bearing on concrete must be pressure treated lumber. Foundation plates or wall sills bearing on concrete foundations shall be bolted to the foundation with a minimum of 5/8 x 10 inch steel bolts embedded at least 7 inches into the concrete. Bolts must not be spaced over 6 feet apart. A minimum of two bolts are required per piece. Bolts must be located no more than 12 inches and no less than 3 1/2 inches from each end of each piece. Each bolt must have a 2" x 2" x 3/16" plate washer under the nut.

STUDS

The size, height and spacing of studs shall be in accordance with Table 23-IV-B. Studs shall be placed with their wide dimension perpendicular to the wall. At least three studs need to be installed at each corner of an exterior wall.

TABLE 23-IV-B—SIZE, HEIGHT AND SPACING OF WOOD STUDS

STUD SIZE (Inches)	BEARING WALLS				NONBEARING WALLS	
	Laterally Unsupported Stud Height ¹ (feet)	Supporting Roof and Ceiling Only	Supporting One Floor, Roof and Ceiling	Supporting Two Floors, Roof and Ceiling	Laterally Unsupported Stud Height ¹ (feet)	Spacing (Inches)
		Spacing (Inches)				
× 25.4 for mm	× 304.8 for mm	× 25.4 for mm			× 304.8 for mm	× 25.4 for mm
1. 2 × 3 ²	—	—	—	—	10	16
2. 2 × 4	10	24	16	—	14	24
3. 3 × 4	10	24	24	16	14	24
4. 2 × 5	10	24	24	—	16	24
5. 2 × 6	10	24	24	16	20	24

¹Listed heights are distances between points of lateral support placed perpendicular to the plane of the wall. Increases in unsupported height are permitted where justified by an analysis.

²Shall not be used in exterior walls.

TOP PLATES

Bearing and exterior wall studs shall be capped with a double top plate installed to provide overlapping at corners and intersections with other walls. End joints in double top plates must be offset by at least 4 feet.

WALL BRACING

The traditional method of using let-in diagonal braces is no longer allowed in earthquake zone 4, which includes the City of San Bruno. This applies to metal diagonal braces as well as wood. The only method of wall bracing now allowed (other than an engineered design) is Braced Wall Panels.

Braced Wall Panels: Braced Wall Panels are solid wall sections with no openings. They are similar to shear panels, but they need not be designed by an engineer for a particular location. The CBC lists 7 types of Panels which can be used in our earthquake zone. The most commonly used are:

Wood structural panel sheathing, minimum 5/16" on 16" o.φ. studs and minimum 3/8" on 24" o.φ. studs. This term includes not only plywood, but OSB and similar products. Nailing is 6" o.φ. at edges and 12" o.φ. in the field.

Three-coat stucco on studs 16" o.c.

Braced Wall Panels must be at least 48" wide, except that gypsum wallboard Panels must be 96" wide if applied to one side of the wall, and 48" wide if applied to both sides. They must extend from the floor to the ceiling, or if there is no ceiling, to the roof.

All vertical joints of Braced Wall Panels must be on studs and all horizontal joints must be blocked.

The bottoms of Braced Wall Panels must be attached in the following manner:

Wood Floor: Bottom plates of the panels should be nailed to floor framing with 3 16d nails every 16". This usually requires putting extra joists or blocking in the floor frame to provide backing for the interior panels.

Slab Floor or Foundation: Bottom plates of panels in exterior walls must be attached to the slab or foundation with anchor bolts. Interior panels must be attached with anchor bolts or with 3" shots placed 6" and 10" from each end, plus 18" o.c. The shots must be a type which are listed for this use.

The tops of Braced Wall Panels must be attached to the floor above if there is one, to the ceiling, or if the building has no ceiling, such as a garage, the tops of the Panels must extend up to the roof.

Each Braced Wall Panel must be shown on the plans with an indication of which type it is, and with enough dimensioning to show that it meets the location requirements described under **Braced Wall Lines** below.

Alternate Braced Wall Panels: An Alternate Braced Wall Panel may be substituted for any Braced Wall Panel in the first story. The requirements are as follows:

- 1) Minimum width is 32" and maximum height is 10'.
- 2) Each Alternate Panel must be supported directly on a foundation or on a floor supported directly on a foundation. Cripple walls are not permitted below Alternate Panels.
- 3) Minimum 3/8" plywood sheathing, all edges attached to framing or blocking, with 8d @ 6" o.c. at edges and 12" o.c. in the field. For the first story of a two-story building, the plywood must be on both sides of the Alternate Panel.
- 4) Each Alternate Panel must have 2 - 1/2 x 10 anchor bolts at 1/4 points of the Panel. For the first story of a two-story building, there must be 3 such anchor bolts at 1/5 points.
- 5) A holdown rated for at least 1800 pounds uplift must be installed at each end of the Alternate Panel in accordance with the manufacturer's instructions. For the first story of a two-story building, the uplift rating must be at least 3000 pounds.
- 6) The entire Braced Wall Line (see below) containing the Alternate Panel must have a continuous foundation with at least 2 continuous #4 rebars.

Braced Wall Lines: Braced Wall Lines consist of a series of Braced Wall Panels. In order for a wall line to be considered a Braced Wall Line, it must have Braced Wall Panels no more than 8' from each end and no more than 25' c/c throughout the entire length of the wall line. These panels must be in line or offset from each other no more than 4'. In addition, Braced Wall Lines supporting 1 floor above must have total panel length of at least 25% of the building length parallel to the Wall Line. If the Braced Wall Panels consist of gypsum wallboard applied to one side of the wall, the required percentage must be doubled.

There are no requirements for the wall between the panels, in fact there need not be any wall between the panels. A Braced Wall Line can consist only of the required Braced Wall Panels, located as described above, with the bottoms properly attached to the floor or foundation, and the tops attached to the floor above, the ceiling, or the roof.

All non-engineered buildings must have Braced Wall Lines throughout, running in both directions (front to back and side to side). The maximum distance between parallel Braced Wall Lines in the City of San Bruno (it varies with wind and seismic zones) is 25'. The exception is that the house can have one room with a maximum 34'

between braced wall panels. That room is limited under this exception to 900 square feet. Therefore, generally, the building must be divided into "boxes" which are no more than 25' in either direction, and each side of each "box" must be a Braced Wall Line or part of a Braced Wall Line. Remember that, if these bracing requirements are too restrictive for the design you prefer, you may submit plans with the bracing designed by a California licensed architect or engineer.

Unusually Shaped Buildings: This term is used in the 1998 California Building Code to describe wood-framed buildings which require engineering. It includes a list of conditions which automatically put a building into that category.

Laterally unsupported edges of floors and roofs are one of the above-mentioned conditions. Generally, all edges of floors and roofs must be laterally supported by Braced Wall Lines. This becomes an issue in floors with open edges such as balconies and mezzanines, and in open roofed structures such as patios and carports. An exception is made for floors and roofs which extend no more than 6' beyond a supporting Braced Wall Line. It also becomes an issue with cantilevered roofs, whether trusses or rafters, where the roof is not directly connected to the top of the Braced Wall Line, and therefore not laterally supported by it. This latter situation can be remedied by extending the Braced Wall Panels past the ceiling up to the roof. This involves building the panels around the ceiling framing or trusses.

Angles between Braced Wall Lines other than 90 degrees is another condition which automatically requires engineering.

CRIPPLE WALLS

Foundation cripple walls shall be framed of studs not less in size than the studding above, or shall be framed of solid blocking. When exceeding four feet in height, such walls shall be framed of studs having the size required for an additional story.

Such walls having a stud height exceeding fourteen inches shall be braced in accordance with Table 23-IV-C-2. Solid blocking or plywood sheathing may be used to brace cripple walls having a stud height of fourteen inches or less.

Remember that methods #1 and #7 cannot be used to brace cripple walls in seismic zone 4.

TABLE 23-IV-C-2—CRIPPLE WALL BRACING

SEISMIC ZONE	CONDITION	AMOUNT OF CRIPPLE WALL BRACING ^{1,2}
		× 25.4 for mm
4	One story above cripple wall	$\frac{3}{8}$ " wood structural panel with 8d at 6"/12" nailing on 60 percent of wall length minimum
	Two story above cripple wall	$\frac{3}{8}$ " wood structural panel with 8d at 4"/12" nailing on 50 percent of wall length minimum or $\frac{3}{8}$ " wood structural panel with 8d at 6"/12" nailing on 75 percent of wall length minimum
3	One story above cripple wall	$\frac{3}{8}$ " wood structural panel with 8d at 6"/12" nailing on 40 percent of wall length minimum
0, 1 and 2	One story above cripple wall	$\frac{3}{8}$ " wood structural panel with 8d at 6"/12" nailing on 30 percent of wall length minimum
0, 1, 2 and 3	Two story above cripple wall	$\frac{3}{8}$ " wood structural panel with 8d at 4"/12" nailing on 40 percent of wall length minimum or $\frac{3}{8}$ " wood structural panel with 8d at 6"/12" nailing on 60 percent of wall length minimum

¹Braced panel length shall be at least two times the height of the cripple wall, but not less than 48 inches (1219 mm).

²All panels along a wall shall be nearly equal in length and shall be nearly equally spaced along the length of the wall.

STRUCTURAL WOOD PANEL WALL SHEATHING

Nails or other approved fasteners shall be driven flush but shall not fracture the surface of the structural wood panel.

Nails shall be placed not less than 3/8" in from the panel edge, shall be spaced not more than six inches on center along panel edge bearings, and shall be firmly driven into the framing members. Some shearwalls required tighter nail spacing.

Framing members or blocking shall be provided at the edges of all sheets in Braced Wall Panels and shearwalls.

CUTS, NOTCHES AND BORED HOLES FOR PIPING

Where plumbing, heating or other pipes are run through the top or bottom plates of walls and these plates are cut partially or totally through, they must have a 1 1/2" wide 16 gauge metal tie fastened across them with six 16d nails on each side of the opening. Studs in exterior walls and bearing walls must not be cut or notched more than 25 percent of their width (i.e., 7/8" for 2 x 4's or 1 3/8" for 2 x 6's). Cutting or notching up to forty percent of stud width is permitted in non-bearing partitions.

A bored hole not exceeding forty percent of the stud width (i.e., 1 3/8" for a 2 x 4 or 2 1/4" for a 2 x 6) may be made in any stud provided the edge of the hole is no nearer to the face of the stud than 5/8". If holes up to sixty percent of the width of the stud are made, the wall studs must be doubled, and no more than two successive studs can be bored. Holes up to sixty percent of the stud width can be made in non-bearing walls without doubling (i.e., 2 1/8" for a 2 x 4, and 3 1/4" for a 2 x 6).

FIRE BLOCKS

Fire blocking is required in all stud walls at ceilings and floor levels. The vertical distance between blocking shall not exceed ten feet. It is also required where a ceiling is below the top plate of the wall such as soffit ceilings, and around the edges of tubs and showers on wood floors. Holes for pipes that pass from one floor level to another or into an attic space must have the openings firestopped with non-combustible material. Where insulation batts are used as fireblocking between studs, they must be stapled in place.

Fire blocks must be a minimum of 2X nominal thickness or 23/32 plywood with joints backed with 23/32 plywood, or gypsum board, mineral wool, or other non-combustible material securely fastened in place.

ROOF AND CEILING FRAMING

RAFTERS

Rafters must be framed directly opposite each other at the ridge and blocked over end bearings. The ridge board must be not less in depth than the plumb end of the rafter. Usually a ridge board one size bigger than the rafter will meet this requirement, but at some steeper pitches, a larger size may be required. Valley and hip rafters must be a minimum of 2X thickness and again not less in depth than the plumb end of the rafters.

RAFTERS TIES

Rafter ties which form a continuous tie between exterior walls are required on all roof framing. These ties may be the ceiling joists if parallel to the rafters or may be separate 1 x 4 minimum ties nailed to opposing rafters. Rafter tie spacing must not exceed four feet.

PURLINS

Rafter spans can be increased through the proper use of purlins as intermediate supports. Purlins must be supported by struts to bearing walls or properly designed beams. Purlins cannot be smaller than the supported rafter. 2 x 6 purlins may span a maximum of six feet. Struts used to support purlins may not be smaller than 2 x 4's. Struts must not exceed eight feet unbraced, and may not be installed at slopes lower than forty-five degrees from horizontal.

ROOF SHEATHING

Structural wood panel sheathing may be of intermediate or exterior grade except at exposed eaves where only exterior grade (not interior grade with exterior glue) is permitted. Joints parallel to framing members must occur over framing members

CEILING FRAMING

Ceiling joists cannot be used to brace roof framing. Ceiling joists 2 x 6 and larger should be solidly blocked at ends unless nailed directly to rafters. Refer to the span tables for maximum allowable spans. Strongbacks are not given any credit when evaluating maximum span.

ATTIC VENTILATION

Enclosed attics shall have cross ventilation. It is recommended that high (exhaust) and low (intake) ventilation is used. Where high and low ventilation is approximately equal, one square foot of ventilation for each three hundred square feet of attic area is required. Where high and low ventilation is not used one square foot per 150 square feet is required. Screen vents must be 1/4" mesh.

ROOF COVERINGS

As per San Bruno Municipal Code Section 11.04.100:

11.04.100 Section 1503 amended--Roof covering. Section 1503 of the Building Code is amended to read as follows:

The roof covering assembly on any structure regulated by this code shall be as specified in Table 15-A and as classified in section 1504 with minimum Class B fire-retardant rating.

MAXIMUM ALLOWABLE SPANS - 1998 CALIFORNIA BUILDING CODE

FLOOR JOISTS -- 40# LL + 10# DL BASED ON TABLE 23-IV-J-1

	12" o.c.	16" o.c.	19.2" o.c.	24" o.c.
2x6 #2 DF	10' 9"	9' 9"	9' 0"	7' 11"
2x6 #1 DF	10' 11"	9' 11"	9' 4"	8' 6"
2x6 SS DF	11' 4"	10' 4"	9' 8"	9' 0"
2x8 #2 DF	14' 2"	12' 7"	11' 3"	10' 2"
2x8 #1 DF	14' 5"	13' 1"	12' 1"	11' 0"
2x8 SS DF	15' 0"	13' 7"	12' 10"	11' 11"
2x10 #2 DF	17' 8"	15' 3"	14' 0"	12' 3"
2x10 #1 DF	18' 5"	16' 5"	14' 9"	13' 4"
2x10 SS DF	19' 1"	17' 4"	16' 4"	15' 2"
2x12 #2 DF	20' 6"	17' 7"	16' 0"	14' 4"
2x12 #1 DF	21' 11"	19' 1"	17' 0"	15' 4"
2x12 SS DF	23' 3"	21' 1"	19' 10"	18' 5"

CEILING JOISTS -- 10# LL + 5# DL BASED ON TABLE 23-IV-J-3

	12" o.c.	16" o.c.	19.2" o.c.	24" o.c.
2x4 Standard DF	N/A	N/A	N/A	N/A
2x4 Stud DF	10' 7"	9' 4"	8' 5"	N/A
2x4 #2 DF	12' 5"	11' 3"	10' 7"	9' 10"
2x4 #1 DF	12' 8"	11' 6"	10' 10"	10' 0"
2x4 SS DF	13' 2"	11' 11"	11' 3"	10' 5"
2x6 #2 DF	19' 6"	17' 8"	16' 4"	14' 9"
2x6 #1 DF	19' 11"	18' 1"	17' 0"	15' 9"
2x6 SS DF	20' 8"	18' 9"	17' 8"	16' 4"
2x8 #2 DF	25' 8"	23' 4"	21' 6"	19' 6"
2x8 #1 DF	26' 0"	23' 10"	22' 5"	19' 11"
2x8 SS DF	26' 0"	24' 8"	23' 3"	21' 7"
2x10 #2 DF	26' 0"	26' 0"	26' 0"	26' 0"

RAFTERS -- 20# LL + 10# DL
BASED ON TABLE 23-IV-R-1

	12" o.c.	16" o.c.	19.2" o.c.	24" o.c.
2x4 Standard DF	6' 11"	6' 0"	5' 5"	4' 11"
2x4 Stud DF	7' 10"	6' 9"	6' 2"	5' 6"
2x4 #2 DF	10' 9"	9' 4"	8' 6"	7' 7"
2x4 #1 DF	10' 9"	9' 10"	9' 0"	8' 0"
2x4 SS DF	11' 4"	10' 4"	9' 8"	9' 0"
2x6 #2 DF	15' 11"	13' 9"	12' 7"	11' 3"
2x6 #1 DF	16' 11"	14' 8"	13' 4"	11' 11"
2x6 SS DF	17' 10"	16' 3"	15' 2"	14' 2"
2x8 #2 DF	19' 6"	16' 10"	15' 5"	13' 9"
2x8 #1 DF	20' 11"	18' 1"	16' 7"	14' 10"
2x8 SS DF	23' 7"	21' 5"	20' 0"	18' 4"
2x10 #2 DF	23' 11"	20' 8"	18' 11"	16' 11"
2x10 #1 DF	25' 10"	22' 4"	20' 5"	18' 3"
2x10 SS DF	26' 0"	26' 0"	25' 0"	22' 4"

RAFTERS -- 20# LL + 15# DL
BASED ON TABLE 23-IV-R-3

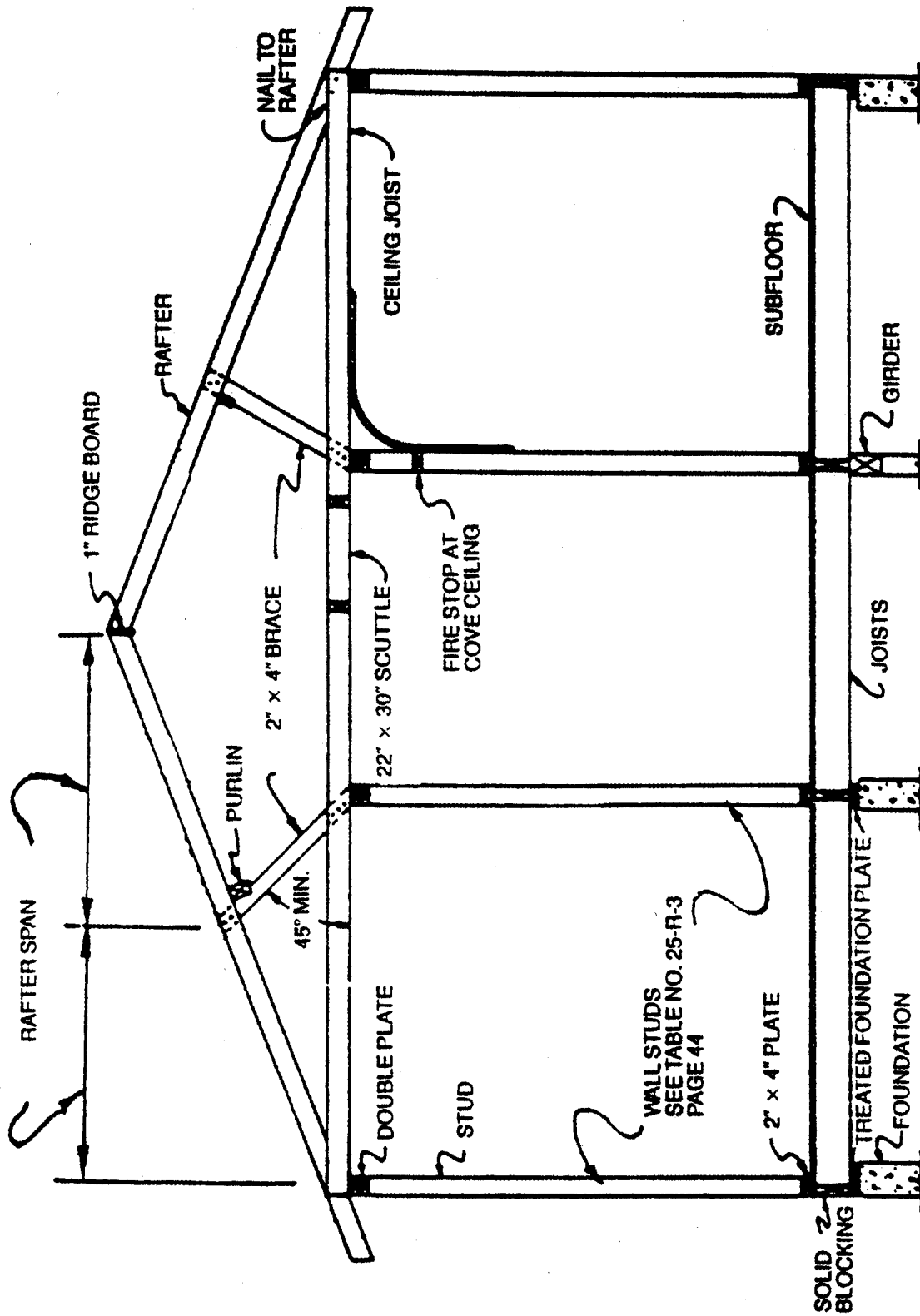
	12" o.c.	16" o.c.	19.2" o.c.	24" o.c.
2x4 Standard DF	6' 5"	5' 6"	5' 1"	4' 6"
2x4 Stud DF	7' 3"	6' 3"	5' 9"	5' 1"
2x4 #2 DF	9' 11"	8' 7"	7' 10"	7' 0"
2x4 #1 DF	10' 6"	9' 1"	8' 4"	7' 5"
2x4 SS DF	11' 4"	10' 3"	9' 9"	9' 0"
2x6 #2 DF	14' 8"	12' 9"	11' 7"	10' 5"
2x6 #1 DF	15' 8"	13' 7"	12' 4"	11' 1"
2x6 SS DF	17' 10"	16' 1"	14' 8"	13' 2"
2x8 #2 DF	18' 0"	15' 7"	14' 3"	12' 9"
2x8 #1 DF	19' 5"	16' 9"	15' 4"	13' 8"
2x8 SS DF	23' 6"	20' 9"	19' 0"	17' 0"
2x10 #2 DF	22' 1"	19' 2"	17' 6"	15' 8"
2x10 #1 DF	23' 11"	20' 8"	18' 11"	16' 11"
2x10 SS DF	26' 0"	25' 4"	23' 1"	20' 8"

FLOOR GIRDERS -- 40# LL + 10# DL

Floor loads only - roof or ceiling loads need additional support

DF	4x6 #2 DF	4x8 #2 DF	4x10 #2 DF	4x12 #2
4' o.ϕ.	8' 2"	10' 9"	13' 2"	15' 4"
4' 6" o.ϕ.	7' 8"	10' 1"	12' 5"	14' 6"
5' o.ϕ.	7' 3"	9' 7"	11' 9"	13' 9"
5' 6" o.ϕ.	6' 11"	9' 2"	11' 3"	13' 1"
6' o.ϕ.	6' 8"	8' 9"	10' 9"	12' 6"
6' 6" o.ϕ.	6' 5"	8' 5"	10' 4"	12' 0"
7' o.ϕ.	6' 2"	8' 1"	9' 11"	11' 7"
7' 6" o.ϕ.	5' 11"	7' 10"	9' 7"	11' 2"
8' o.ϕ.	5' 9"	7' 7"	9' 4"	10' 10"
9' o.ϕ.	5' 5"	7' 2"	8' 9"	10' 3"
10' o.ϕ.	5' 2"	6' 9"	8' 4"	9' 8"
12' o.ϕ.	4' 8"	6' 2"	7' 7"	8' 10"

TYPICAL CROSS SECTION VIEW



NAILING SCHEDULE

TABLE 23-II-B-1—NAILING SCHEDULE

CONNECTION	NAILING ¹
1. Joist to sill or girder, toenail	3-8d
2. Bridging to joist, toenail each end	2-8d
3. 1" × 6" (25 mm × 152 mm) subfloor or less to each joist, face nail	2-8d
4. Wider than 1" × 6" (25 mm × 152 mm) subfloor to each joist, face nail	3-8d
5. 2" (51 mm) subfloor to joist or girder, blind and face nail	2-16d
6. Sole plate to joist or blocking, typical face nail Sole plate to joist or blocking, at braced wall panels	16d at 16" (406 mm) o.c. 3-16d per 16" (406 mm)
7. Top plate to stud, end nail	2-16d
8. Stud to sole plate	4-8d, toenail or 2-16d, end nail
9. Double studs, face nail	16d at 24" (610 mm) o.c.
10. Doubled top plates, typical face nail Double top plates, lap splice	16d at 16" (406 mm) o.c. 8-16d
11. Blocking between joists or rafters to top plate, toenail	3-8d
12. Rim joist to top plate, toenail	8d at 6" (152 mm) o.c.
13. Top plates, laps and intersections, face nail	2-16d
14. Continuous header, two pieces	16d at 16" (406 mm) o.c. along each edge
15. Ceiling joists to plate, toenail	3-8d
16. Continuous header to stud, toenail	4-8d
17. Ceiling joists, laps over partitions, face nail	3-16d
18. Ceiling joists to parallel rafters, face nail	3-16d
19. Rafter to plate, toenail	3-8d
20. 1" (25 mm) brace to each stud and plate, face nail	2-8d
21. 1" × 8" (25 mm × 203 mm) sheathing or less to each bearing, face nail	2-8d
22. Wider than 1" × 8" (25 mm × 203 mm) sheathing to each bearing, face nail	3-8d
23. Built-up corner studs	16d at 24" (610 mm) o.c.
24. Built-up girder and beams	20d at 32" (813 mm) o.c. at top and bottom and staggered 2-20d at ends and at each splice
25. 2" (51 mm) planks	2-16d at each bearing
26. Wood structural panels and particleboard ² : Subfloor and wall sheathing (to framing): 1/2" (12.7 mm) and less 19/32"-3/4" (15 mm-19 mm) 7/8"-1" (22 mm-25 mm) 1 1/8"-1 1/4" (29 mm-32 mm) Combination subfloor-underlayment (to framing): 3/4" (19 mm) and less 7/8"-1" (22 mm-25 mm) 1 1/8"-1 1/4" (29 mm-32 mm)	6d ³ 8d ⁴ or 6d ⁵ 8d ⁵ 10d ⁴ or 8d ⁵ 6d ⁵ 8d ⁵ 10d ⁴ or 8d ⁵
27. Panel siding (to framing): ² 1/2" (12.7 mm) or less 5/8" (16 mm)	6d ⁶ 8d ⁶
28. Fiberboard sheathing: ⁷ 1/2" (12.7 mm) 25/32" (20 mm)	No. 11 ga. ⁸ 6d ⁴ No. 16 ga. ⁹ No. 11 ga. ⁸ 8d ⁴ No. 16 ga. ⁹
29. Interior paneling 1/4" (6.4 mm) 3/8" (9.5 mm)	4d ¹⁰ 6d ¹¹

¹Common or box nails may be used except where otherwise stated.

²Nails spaced at 6 inches (152 mm) on center at edges, 12 inches (305 mm) at intermediate supports except 6 inches (152 mm) at all supports where spans are 48 inches (1219 mm) or more. For nailing of wood structural panel and particleboard diaphragms and shear walls, refer to Sections 2315.3.3 and 2315.4. Nails for wall sheathing may be common, box or casing.

³Common or deformed shank.

⁴Common.

⁵Deformed shank.

⁶Corrosion-resistant siding or casing nails conforming to the requirements of Section 2304.3.

⁷Fasteners spaced 3 inches (76 mm) on center at exterior edges and 6 inches (152 mm) on center at intermediate supports.

⁸Corrosion-resistant roofing nails with $7/16$ -inch-diameter (11 mm) head and $1\frac{1}{2}$ -inch (38 mm) length for $\frac{1}{2}$ -inch (12.7 mm) sheathing and $1\frac{3}{4}$ -inch (44 mm) length for $\frac{25}{32}$ -inch (20 mm) sheathing conforming to the requirements of Section 2304.3.

⁹Corrosion-resistant staples with nominal 1/16-inch (1.6 mm) crown and 1 1/8-inch (29 mm) length for 1/2-inch (12.7 mm) sheathing and 1 1/2-inch (38 mm) length for 25/32-inch (20 mm) sheathing conforming to the requirements of Section 2304.3.

¹⁰Panel supports at 16 inches (406 mm) [20 inches (508 mm) if strength axis in the long direction of the panel, unless otherwise marked]. Casing or finish nails spaced 6 inches (152 mm) on panel edges, 12 inches (305 mm) at intermediate supports.

¹¹Panel supports at 24 inches (610 mm). Casing or finish nails spaced 6 inches (152 mm) on panel edges, 12 inches (305 mm) at intermediate supports.

DRYWALL

GENERAL

Drywall (sheetrock) is the interior finish most commonly used in residential construction. The following guidelines pertain to its application.

Gypsum wallboard shall not be installed until weather protection for the installation is provided.

When practical, wallboard should be applied first to the ceilings, and then to walls. Sheets should be brought into contact but not forced into place. Spaces between sheets should not exceed 1/4" and tapered edges should be placed next to each other when possible.

Cutouts for electrical outlets, pipes, fixtures or other small openings should be cut out neatly with a maximum clearance of 1/4". If there are any gaps exceeding 1/4", they must be filled with taping compound and drywall tape.

NAILING

Nails should be driven so that the head is in a small dimple formed by the last blow of the hammer. Take care not to fracture the board when nailing. Fractures of the wallboard caused by over driving must be corrected by additional nailing. Nails must be between 3/8" and 1" from the edges, and nails on adjacent edges should be opposite each other. If you are using the single nailing system, the nails should be spaced 7" on center on the ceilings and 8" on center on the walls. The double nailing system is also permitted. Groups of two nails 2 - 2 1/2" apart are spaced 12" on center in this system. Approved screws may also be used to apply wallboard. Screws must be placed 3/8" from the end or edges of the board and spaced 12" on center. Screws must be used for fastening wallboard at pocket doors.

Fasteners at the top and bottom plates of vertical assemblies, or the edges and ends of horizontal assemblies perpendicular to supports, and at the wall line may be omitted except on shear-resisting elements or fire resistive assemblies. All edges of Braced Wall Panels and firewalls must be nailed to framing.

CORNERS

All metal reinforced corners must fit snugly against wallboard and should be nailed approximately 12" on center. All "L" edge metal trim should be nailed every 6". Paperback corner bead is acceptable if installed in accordance with the manufacturer's instructions.

DRYWALL IN SHOWER ENCLOSURES

Water-resistant drywall may be used as backing for tile on shower walls, but it can't be put on ceilings unless the framing is no more than 12" o.c.

DRYWALL IN FIRE RESISTIVE CONSTRUCTION

There are two areas in residential construction where one-hour fire resistive construction is required. One area is the wall separating an attached garage from the living area, and the other is enclosed useable space (walls and ceilings) under a stairway. A typical one-hour firewall is constructed as follows: 5/8" type "X" gypsum wallboard is nailed 7" on center to studs spaced 16" on center and at all edges. All gaps and penetrations must be taped or fire-caulked.

RECOMMENDED FASTENERS FOR DRYWALL

3/8" thick drywall:

5d cement-coated box nail, or
1 3/8" drywall nail

1/2" thick drywall:

5d cement coated box nail, or
1 5/8" drywall nail

5/8" thick drywall:

6d cement-coated box nail, or
1 7/8" drywall nail

Screws shall be long enough for the full-diameter portion to penetrate into wood framing not less than 5/8 inch and through metal framing not less than 1/4 inch.